

IN THE CLAIMS:

Please amend the claims as follows:

Claim 1 (Currently Amended): A music structure detection apparatus detecting a structure of a music piece in accordance with chord progression music data representing chronological changes in chords in the music piece, comprising:

a partial music data producing device which produces partial music data pieces each including a predetermined number of consecutive ~~chords~~ chord transitions starting from a position of each chord transition in said chord progression music data;

a comparator which compares each of said partial music data pieces with said chord progression music data from each of the starting chord positions in said chord progression music data, on the basis of an amount of change in a root of a chord in each chord transition and an attribute indicating a type of ~~[[the]]~~ chord after the chord transition, thereby calculating degrees of similarity for each of said partial music data pieces;

a chord position detector which detects a position of a chord transition in said chord progression music data where ~~the calculated similarity degree indicates a peak value higher than a predetermined value~~ at least one indicating higher similarity of the similarity degrees calculated for each of said partial music data pieces is obtained; and

an output device which calculates ~~[[the]]~~ a number of times that the calculated similarity degree indicates ~~a peak value higher than said predetermined value~~ the higher similarity for all said partial music data pieces for each chord transition position in said chord progression music

data, thereby producing a detection output representing the structure of the music piece in accordance with the calculated number of times for each chord transition position.

Claim 2 (Currently Amended): The music structure detection apparatus according to claim 1, wherein

said comparator compares each of said partial music data pieces with said chord progression music data in the basis of the amount of change in the root of a chord in ~~[[a]]~~ each chord transition ~~from each chord~~ position in said chord progression music data, the attribute of the chord after the transition and a ratio of time lengths ~~[[of]]~~ for which the chord before and a chord after the transition are maintained, so as to calculate the similarity degrees for each of said partial music data pieces.

Claims 3 and 4 (Canceled).

Claim 5 (Currently Amended): The music structure detection apparatus according to claim 1, ~~wherein~~ further comprising a data making portion which makes first and second chord candidates indicating in chronological order a chord for each chord transition of the music piece in accordance with an input audio signal representing the music piece, each of said partial music data pieces and said chord progression music data each ~~have two chords as~~ having the first and second chord candidates ~~for each chord transition point~~, and

said comparator ~~mutually~~ compares the first and second chord candidates of each of said partial music data pieces and the first and second chord candidates of said chord progression music data.

Claim 6 (Currently Amended): The music structure detection apparatus according to claim 5, ~~further comprising:~~ wherein said data making portion includes:

a frequency converter which ~~converts~~ samples an input audio signal representing a music piece at predetermined time intervals, and converts the sampled audio signal into a frequency signal representing a level of a frequency component at predetermined time intervals for each frequency component;

a component extractor which extracts a frequency component corresponding to each tempered tone from the frequency signal obtained by said frequency converter at said predetermined time intervals;

a chord candidate detector which detects two chords each formed by a set of three frequency components as said first and second chord candidates, said three frequency components ~~having a large total level of the frequency components corresponding to the tones extracted by said component extractor~~ being higher in level than the other frequency components of the extracted frequency components; and

a smoothing device which ~~smooths~~ cancels a candidate indicating a noise component in trains of said first and second chord candidates repeatedly detected by said chord candidate detector, so that a same chord is successively arranged in at least two chord candidates including the canceled portion, to produce said chord progression music data.

Claim 7 (Currently Amended): The music structure detection apparatus according to claim 1, wherein

said comparator adds temporary data ~~indicating only said predetermined number of temporary chords~~ having a number of temporary chord transitions equal to the predetermined number of consecutive chord transitions, to the end of said chord progression music data ~~so as to compare with each of said partial music data pieces~~ so that all the chord transition positions of said chord progression music data can have a number of chord transitions equal to the predetermined number of consecutive chord transitions in an ending direction of the said chord progression music data.

Claim 8 (Currently Amended): The music structure detection apparatus according to claim 1, wherein

said output device ~~reproduces music sound of a part calculated the largest number of times for each chord position in said chord progression music data to output the music sound~~ detects a maximum of the calculated numbers of times for the respective chord transition positions in said chord progression music data, and outputs sound of the music piece from a position in the music piece corresponding to a chord transition position where the maximum is obtained.

Claim 9 (Currently Amended): A method of detecting a structure of a music piece in accordance with chord progression music data representing chronological changes in chords in the music piece, said method comprising the steps of:

producing partial music data pieces each including a predetermined number of consecutive ~~chords~~ chord transitions starting from a position of each chord transition in said chord progression music data;

comparing each of said partial music data pieces with said chord progression music data from each of the starting chord positions in said chord progression music data, on the basis of an amount of change in a root of a chord in each chord transition and an attribute indicating a type of ~~[[the]]~~ chord after the transition, thereby calculating degrees of similarity for each of said partial music data pieces;

detecting a position of a chord transition in said chord progression music data where ~~the calculated similarity degree indicates a peak value higher than a predetermined value~~ at least one indicating higher similarity of the similarity degrees calculated for each of said partial music data pieces is obtained; and

calculating ~~[[the]]~~ a number of times that the calculated similarity degree indicates ~~a peak value higher than said predetermined value~~ the higher similarity for all said partial music data pieces for each chord transition position in said chord progression music data, thereby producing a detection output representing the structure of the music piece in accordance with the calculated number of times for each chord transition position.

Claim 10 (Currently Amended): A computer program product comprising a program for detecting a structure of a music piece, said detecting comprising the steps of:

producing partial music data pieces each including a predetermined number of consecutive ~~chords~~ chord transitions starting from a position of each chord transition in said chord progression music data;

comparing each of said partial music data pieces with said chord progression music data from each of the starting chord positions in said chord progression music data, on the basis of an amount of change in a root of a chord in each chord transition and an attribute indicating a type of ~~the~~ chord after the chord transition, thereby calculating degrees of similarity for each of said partial music data pieces;

detecting a position of a chord transition in said chord progression music data where ~~the calculated similarity degree indicates a peak value higher than a predetermined value at least one~~ indicating higher similarity of the similarity degrees calculated for each of said partial music data pieces is obtained; and

calculating ~~the~~ a number of times that the calculated similarity degree indicates ~~a peak value higher than said predetermined value~~ the higher similarity for all said partial music data pieces for each chord transition position in said chord progression music data, thereby producing a detection output representing the structure of the music piece in accordance with the calculated number of times for each chord transition position.

Claim 11 (New): The music structure detection apparatus according to claim 1, wherein said comparator makes a first chord differential value train indicating in chronological

order the change amount in a root chord for each chord transition and a first attribute train indicating in chronological order the attribute for each chord transition, in accordance with the chord progression music data, makes a second chord differential value train indicating in chronological order the change amount in a root chord for each chord transition and a second attribute train indicating in chronological order the attribute for each chord transition, in accordance with one of the partial music data pieces, compares the second chord differential value train with the first chord differential value train, and compares the second attribute train with the first attribute train, in order to calculate the similarity degrees for the one partial music data piece.

Claim 12 (New): The music structure detection apparatus according to claim 11, wherein when a chord after one chord transition in the one partial music data piece, and a chord after one chord transition in said chord progression music data are related with each other based on the relative key expression in the music theory by comparing the second chord differential value train with the first chord differential value train, and by comparing the second attribute train with the first attribute train, the comparator regards both the chords after the one transitions as the same chord.

Claim 13 (New): The music structure detection apparatus according to claim 11, wherein said comparator compares an n-th (wherein n is an integer larger than zero) chord differential value and chord differential values arranged before and after the n-th chord differential value of the second chord differential value train with an n-th chord differential value

of the first chord differential value train, and compares an n-th attribute and attributes arranged before and after the n-th attribute of the second attribute train with an n-th attribute of the first attribute train, thereby detecting higher similarity.